

CLAIMS

What is claimed is:

1. A portable apparatus for measuring characteristics of a hydraulic feature in a river or stream, comprising:
 - a measuring rod, said measuring rod adapted to measure characteristics of a hydraulic feature;
 - means for positioning said measuring rod in a desired location relative to a hydraulic feature; and
 - a platform;
 - said platform adapted to support said positioning means;
 - said platform further adapted for positioning adjacent a hydraulic feature.
2. An apparatus as recited in claim 1, wherein said measuring rod has a hollow hexagonal cross section.
3. An apparatus as recited in claim 1, wherein said measuring rod has a round tubular cross section.
4. An apparatus as recited in claim 1, wherein said measuring rod has a visual index to measure the position of said measuring rod relative to said positioning means.
5. An apparatus as recited in claim 1 wherein said measuring rod is adapted to accommodate sensors selected from the group consisting essentially of a differential pressure sensor, a time domain reflectometer, a current meter, a propeller, an electromagnetic velocimeter, an acoustic Doppler velocimeter, a digital camera and a video camera.
6. An apparatus as recited in claim 1, wherein said platform comprises a tripod having adjustable legs.

7. An apparatus as recited in claim 1, wherein said means for positioning comprises:

- a boom, said boom oriented horizontally and coupled to said platform;
- said boom adapted to articulate on a vertical axis through said platform;
- said boom further adapted to extend over a hydraulic feature; and
- a carriage, said carriage adapted to travel along said boom;
- said carriage further adapted to position said measuring rod vertically;

wherein said measuring rod is positioned to measure a characteristic of a hydraulic feature when said boom is positioned at a desired orientation on said platform, said carriage is positioned at a desired location on said boom, and said measuring rod is positioned at a desired elevation relative to a hydraulic feature.

8. An apparatus as recited in claim 7, wherein said platform comprises:

- a tripod, said tripod having adjustable legs;
- a mast, said mast coupled to said tripod; and
- a support cable having a first end, a mid portion and a second end;
- said first end of said support cable coupled to said boom;
- said mid portion of said support cable slidingly coupled to said mast; and
- said second end of said support cable adapted to be coupled to an anchoring object.

9. An apparatus as recited in claim 7, wherein said means for positioning further comprises:

- a winch, said winch coupled to said boom;
- a winch cable, said winch cable having a first end and a second end, said first end coupled to said winch; and
- a pulley, said pulley coupled to said carriage;
- said pulley adapted to support said winch cable;
- said second end of said winch cable coupled to said measuring rod;

wherein said measuring rod is repositioned upward when said winch cable is

retracted by said winch through said pulley.

10. An apparatus as recited in claim 7:

wherein said boom comprises a truss with at least two legs; and

wherein said carriage is configured to travel on two legs of said truss.

11. An apparatus as recited in claim 7, wherein said means for positioning further comprises:

a support carriage, said support carriage adapted to travel on said boom; and

a support rod, said support rod slidably coupled to said support carriage;

said support rod adapted to contact the ground and provide vertical support to said boom through said support carriage;

wherein said boom is supported when said support carriage is positioned in a desired location on said boom and said support rod is positioned to contact the ground and is secured to said support carriage.

12. An apparatus as recited in claim 1, wherein said apparatus is adapted to measure characteristics selected from the group consisting essentially of air quality, weather, water quality, soils, sediments, volcanic gases and hydrothermal fluids.

13. An apparatus as recited in claim 12 wherein said apparatus is adapted to accommodate sensors selected from the group consisting essentially of a particle collector, an air sample collector, a diffusive sampler, a thermometer, a psychrometer, a solar radiation detector, a barometer, an air speed indicator, a Nansen-type bottle, an alpha sampler, a pressure-valve sampler, an automated ISCO-type pump sampler, a gravity sediment corer with a core-catcher, an Eckman-type dredge, and an all-plastic Nansen-type bottle.

14. A portable apparatus for measuring characteristics of a hydraulic feature in a river or stream, comprising:

- a platform, said platform adapted for positioning adjacent to a hydraulic feature;

- a boom, said boom coupled to said platform;

- said boom adapted to be oriented horizontally relative to said platform;

- said boom adapted to articulate on a vertical axis through said platform;

- said boom further adapted to extend over a hydraulic feature;

- a carriage, said carriage adapted to travel along said boom;

- means for positioning said carriage on said boom;

- a measuring rod, said measuring rod slidably coupled to said carriage;

- said measuring rod having a measuring end, said measuring end adapted to measure a characteristic of a hydraulic feature; and

- means for positioning said measuring rod vertically relative to said carriage;

- wherein said measuring rod is positioned to measure a characteristic of a hydraulic feature when said boom is positioned at a desired orientation on said platform, said carriage is positioned at a desired location on said boom, and said measuring end of said measuring rod is positioned at a desired elevation relative to a hydraulic feature.

15. An apparatus as recited in claim 14, wherein said platform comprises a tripod having adjustable legs.

16. An apparatus as recited in claim 15, wherein said platform further comprises:

- a mast, said mast coupled to said platform; and

- a support cable having a first end, a mid portion and a second end;

- said first end of said support cable coupled to said boom;

- said mid portion of said support cable slidably coupled to said mast;

- said second end of said support cable coupled to an anchoring object.

17. An apparatus as recited in claim 14, wherein said measuring rod has a hollow hexagonal cross section.

18. An apparatus as recited in claim 14, wherein said measuring rod has a round tubular cross section.

19. An apparatus as recited in claim 14, wherein said measuring rod has a visual index to measure the elevation of said measuring end of said measuring rod relative to said carriage.

20. An apparatus as recited in claim 14, wherein said means for positioning said measuring rod comprises:

- a winch, said winch coupled to said boom;
- a winch cable, said winch cable having a first end and a second end, said first end coupled to said winch; and
- a pulley, said pulley coupled to said carriage;

said pulley adapted to support said winch cable;

said second end of said winch cable coupled to said measuring rod proximate said measuring end;

wherein said measuring end of said measuring rod is repositioned upward when said winch cable is retracted by said winch through said pulley.

21. An apparatus as recited in claim 14, wherein said measuring rod is adapted to accommodate sensors selected from the group consisting essentially of a differential pressure sensor, a time domain reflectometer, a current meter, a propeller, an electromagnetic velocimeter, an acoustic Doppler velocimeter, a digital camera and a video camera.

22. An apparatus as recited in claim 14, said means for positioning said carriage comprises:

- a positioning rod, said positioning rod coupled to said carriage;

said positioning rod adapted to position said carriage at a desired location along said boom;

said positioning rod configured to releasably couple to said platform when said carriage is positioned at a desired location on said boom.

23. An apparatus as recited in claim 14:

wherein said boom comprises a truss with at least two legs; and

wherein said carriage is adapted to travel on two legs of said truss.

24. An apparatus as recited in claim 14, further comprising:

a support carriage, said support carriage adapted to travel on said boom;

a support rod, said support rod slidingly coupled to said support carriage;

said support rod adapted to contact the ground and provide vertical support to said boom through said support carriage;

wherein said boom is supported when said support carriage is positioned in a desired location on said boom and said support rod is positioned to contact the ground and is secured to said support carriage.

25. An apparatus as recited in claim 14, wherein said apparatus is adapted to measure characteristics selected from the group consisting essentially of air quality, weather, water quality, soils, sediments, volcanic gases and hydrothermal fluids.

26. An apparatus as recited in claim 25, wherein said apparatus is adapted to accommodate sensors selected from the group consisting essentially of a particle collector, an air sample collector, a diffusive sampler, a thermometer, a psychrometer, a solar radiation detector, a barometer, an air speed indicator, a Nansen-type bottle, an alpha sampler, a pressure-valve sampler, an automated ISCO-type pump sampler, a gravity sediment corer with a core-catcher, an Eckman-type dredge, and an all-plastic Nansen-type bottle.

27. A portable apparatus for measuring characteristics of a hydraulic feature in a river or stream, comprising:

- a tripod, said tripod adapted for positioning adjacent to a hydraulic feature;
- a boom, said boom coupled to said tripod;
- said boom adapted to be oriented horizontally relative to said tripod;
- said boom adapted to articulate on a vertical axis through said tripod;
- said boom adapted to extend over a hydraulic feature;
- a mast, said mast coupled to said tripod;
- said mast oriented on a vertical axis through said tripod;
- a support cable having a first end, a mid portion and a second end;
- said first end of said support cable coupled to said boom;
- said mid portion of said support cable slidingly coupled to said mast;
- said second end of said support cable coupled to an anchoring object;
- a carriage, said carriage adapted to travel along said boom;
- a positioning rod, said positioning rod coupled to said carriage;
- said positioning rod adapted to position said carriage at a desired location along said boom;
- said positioning rod configured to releasably couple to said tripod; when said carriage is positioned at a desired location on said boom;
- a measuring rod, said measuring rod slidingly coupled to said carriage;
- said measuring rod oriented vertically;
- said measuring rod having a measuring end, said measuring end adapted to measure a characteristic of a hydraulic feature;
- a winch, said winch coupled to said boom;
- a winch cable, said winch cable having a first end and a second end, said first end coupled to said winch; and
- a pulley, said pulley coupled to said carriage;
- said pulley adapted to support said winch cable;
- said second end of said winch cable coupled to said measuring rod proximate said measuring end;
- wherein said measuring end of said measuring rod is repositioned upward

when said winch cable is retracted by said winch through said pulley; and
wherein said measuring rod is positioned to measure a characteristic of a hydraulic feature when said boom is positioned at a desired orientation on said tripod, said carriage is positioned at a desired location on said boom, and said measuring end of said measuring rod is positioned at a desired elevation relative to a hydraulic feature.

28. An apparatus as recited in claim 27, wherein said measuring rod is adapted to accommodate sensors selected from the group consisting essentially of a differential pressure sensor, a time domain reflectometer, a current meter, a propeller, an electromagnetic velocimeter, an acoustic Doppler velocimeter, a digital camera and a video camera.

29. An apparatus as recited in claim 27:
wherein said boom comprises a truss with at least two legs; and
wherein said carriage adapted to travel on two legs of said truss.

30. An apparatus as recited in claim 27, further comprising:
a support carriage, said support carriage adapted to travel on said boom; and
a support rod, said support rod slidingly coupled to said support carriage;
said support rod adapted to contact the ground and provide vertical support to said boom through said support carriage;
wherein said boom is supported when said support carriage is positioned in a desired location on said boom and said support rod is positioned to contact the ground and is secured to said support carriage.

31. An apparatus as recited in claim 27, wherein said apparatus is adapted to measure characteristics selected from the group consisting essentially of air quality, weather, water quality, soils, sediments, volcanic gases and hydrothermal fluids.

32. An apparatus as recited in claim 31, wherein said apparatus is adapted to accommodate sensors selected from the group consisting essentially of a particle collector, an air sample collector, a diffusive sampler, a thermometer, a psychrometer, a solar radiation detector, a barometer, an air speed indicator, a Nansen-type bottle, an alpha sampler, a pressure-valve sampler, an automated ISCO-type pump sampler, a gravity sediment corer with a core-catcher, an Eckman-type dredge, and an all-plastic Nansen-type bottle.

33. A method of measuring characteristics of a hydraulic feature in a river or stream, comprising:

- providing a portable hydraulic feature measuring apparatus, said apparatus comprising a platform, a boom, a carriage and a measuring rod;
- positioning said platform adjacent a hydraulic feature;
- positioning said boom on said platform in a desired orientation;
- positioning said carriage on said boom in a desired location on said boom;
- positioning said measuring rod at a desired elevation; and
- measuring a characteristic of a hydraulic feature through said measuring rod.

34. A method as recited in claim 33, further comprising:

- providing a support carriage and a support rod;
- positioning said support carriage on said boom in a desired location on said boom;
- positioning said support rod to contact the ground; and
- securing said support rod to said support carriage.